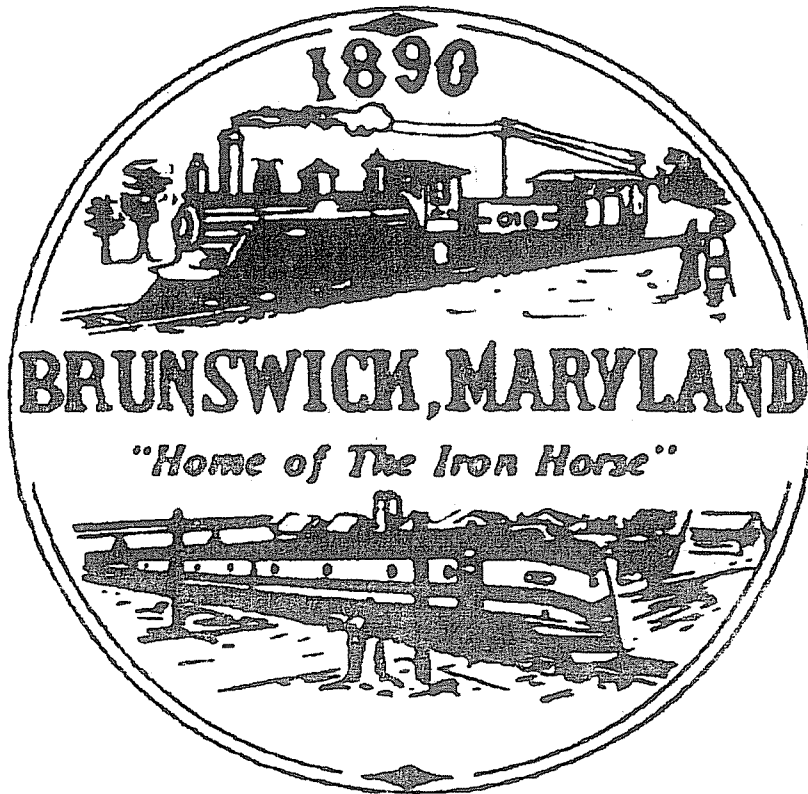


THE CITY OF BRUNSWICK



STANDARDS AND SPECIFICATIONS

Approved and Adopted by Mayor and Council
May 28, 2002.

Standards and Specifications Manual

Revisions

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GENERAL MATERIAL

Materials Listed in These Standards and Specifications Represent the Absolute Minimum Requirements Acceptable for the Use by the City of Brunswick. Specifically, the City of Brunswick Has Reviewed and Consulted the Appropriate Standards Writing Agency with a View to Determine What Materials Most Suit the Specific Design Criteria, Maintenance Needs, and Cost Requirements of the Water and Sewer Departments.

All Pipe, Fittings, and Other Related Materials Used in the Construction of Lines Shall Be in Full Compliance with the Written Specifications and Details of the City of Brunswick's Latest Modifications or Revisions.

Where a Manufactures Name Is Used in These Specifications, it Is Used to Designate a Minimum Standard of Quality Based on the Specific Design Characteristics to the Manufacturer Specified, Not Limited To, but Including, Material Quality, Flow Characteristics, Interchangeability, Design Features, Inventory, Warranty, Maintenance Costs, and Service.

Equality Evaluation Shall Be Determined Not Solely on Whether a Product Is Capable of Doing an Adequate Job, but Rather If a Product Will Perform the Specific Job Specified, as Well as Meeting the Additional Specific Requirements Set Forth Herein.

The City of Brunswick Will Be the Sole Judge as to Whether a Product Shall Be Approved as an Equal.

Any Product Not Specified in the Latest Modifications or Revisions of the City's Written Specifications and Details, must Have the City's Approval Before Shipment to Projects Within the City of Brunswick's Jurisdiction.

Representative Samples of Materials, Intended for the Incorporation in the Specifications of the City of Brunswick, Shall Be Submitted for Examination, And/or Test.

A Written Point-by-point Detailed Comparison to Material Currently Specified Shall Be Submitted with Any Points of Exceptions Noted.

Written Warranties, along with Certifications of Material Compliances, Shall Be Required for All Materials Submitted for Review.

No Set Time Limits Shall Be Given for Material Review. It Is Not the Intent of the Water and Sewer Departments to Compromise the Current Specifications as Written.

Any Product Shipped to Projects Without Prior Approval Shall Be Deemed Unresponsive to the Towns Authority, and Shall Be Removed and Replaced by Approved Materials at No Cost to the City of Brunswick.

Furthermore, Any Product Shipped Without Prior Written Approval, Shall Be Disqualified for Review for Acceptance.

GENERAL MATERIAL

WATER

D U C T I L E I R O N P I P E

Ductile Iron Pipe Shall Be Manufactured in Accordance with the Requirements of Ansi/awwa C151/a21.5. Push-on Joints and Mechanical Joints for Such Pipe Shall Be in Accordance with Ansi/Awwa C111/a21.11.

Pipe Thickness Shall Be Designed in Accordance with Ansi/awwa C150/a21.50, and Shall Be Based on Laying Conditions and Internal Pressure.

Wall Thickness for 3" thru 12" Shall Be C152. Wall Thickness for 14" Through 24" Shall Be C151.

Pipe Shall Be Cement Mortar Lined in Accordance with Ansi/awwa C104/a21.4 Double Lined.

Laying Lengths Shall Be Either 18ft. Or 20ft. Nominal Lengths.

Pipe Larger than 12" Shall Be Shipped with an Appropriate Percentage of Fully Gauged Pipe to Facilitate Fitting Requirements.

Ductile Iron, for Use as Restrained Joint, Shall Be Mechanical Joint Pipe Using Wedge Action Restraining Glands. Pipe Shall Be Used as Indicated on Drawing or Details.

Wall Thickness for 3" thru 12" Shall Be C152. Wall Thickness for 14" Through 24" Shall Be C151.

W A R N I N G T A P E

M A R K I N G T A P E - N O N - D E T E C T A B L E

N O N - D E T E C T A B L E W A R N I N G A N D I D E N T I F I C A T I O N T A P E

Composition of Tape Shall Be Polyethylene and Have a Film Thickness of 4.0 Mil. Nominal and a Width of 6".

Color Shall Be Bright Blue with Black Printed Letters on One Side Stating: Caution Water Line Buried Below.

Tape Shall Be 6" as Manufactured by Pro-line or Approved Equal.

Said Tape Shall Be Installed Two Feet above Pipelines. This Tape Shall Be Installed in Conjunction with Main Lines, Including Service Connections.

M E C H A N I C A L J O I N T F I T T I N G S

Mechanical Joint Fittings in Sizes 3" Through 24" Shall Meet the Requirements of AWWA C153.

Fittings Shall Be Manufactured from a High Strength, Impact Resistant Ductile Iron, Having a Minimum Tensile of 70,000 Psi with a Minimum Yield of 50,000 Psi and a Minimum Elongation of 5%.

Fitting Wall Thickness Shall Be C154 Through 12" Diameters and C156 Through 24" Diameters.

Fittings Shall Be Rated at 350 Psi.

Cement Lining – All Fittings Shall Be Cement-lined in Accordance with ANSI A21.4 – AWWA C111- Latest Revision.

Joint Accessories – All Accessories, Glands, Bolts, and Gaskets Shall Conform to ANSI A21.11-AWWA C111-latest Revision.

Fittings - All Fittings Shall Be Listed with Underwriters Laboratories.

Where Fittings Are to Be Used with PVC Piping Systems, Appropriate Gaskets Shall Be Furnished If Required.

Hydrant Locking Tees Will Be Required for Hydrant Connections.

Fittings Shall Be as Manufactured by Tyler/union or Approved Equal.

W E D G E A C T I O N R E S T R A I N T S F O R P I P E A N D F I T T I N G S

Mechanical Joint Restraints (Figure Wo1 and Wo2) for Ductile Iron Fittings and Pipe Shall Be Incorporated in the Design of the Follower Gland. Said Gland Shall Include a Restraining Mechanism Against the Pipe, Which Increases its Resistance as Pressure Increases.

Glands Shall Be Designed to Allow Flexibility of Pipe Joints after Installation and Backfill.

Glands Shall Be Manufactured of Ductile Iron, Conforming to ASTM A536-80.

Restraining Devices Shall Be of Ductile Iron, Heat-treated to a Minimum Hardness of 370 Bhn.

Dimensions of Gland Shall Be Such That it Can Be Used with the Standardized Mechanical Joint Bell with Tee-head Bolts Conforming to Ansi/awwa A21-11, and Ansi/awwa C153/a21.53 Latest Revision.

The Design Shall Incorporate Twist-off Nuts to Insure Proper Torque upon Installation, Leaving Hex Head Nut for Disassembly If Required.

The Mechanical Joint Restraining Device in Sizes 4" Through 16" Shall Have a Working Pressure of 350 Psi, with a Safety Factor of Two to One.

In Sizes, 18" Through 36" the Working Pressure Shall Be 250 Psi with a Two to One Safety Factor.

Glands Shall Have U.I. Listing Through 12" in Size, and Factory Mutual Approval Through 12".

Restraining Glands Shall Be as Manufactured by the Ford Meter Box Co., Inc., Uni-flange Series 1400.

Wedge Action Retainer Glands Will Be Used on All Valves, Hydrants, and Fittings (Figure Wo3). Concrete Thrust Blocks Shall Also Be Required Unless the Pipe Joints Are Restrained an Appropriate Length from Each Fitting Or, Valve, as Recommended by the Manufacture

F L A N G E J O I N T F A B R I C A T E D P I P E

Flanged Ductile Iron Pipe Shall Be Manufactured in Accordance with Ansi/awwa C115/a21.15 and Have a Minimum Wall Thickness of Class 53.

Flanges Shall Conform to Class 125 Lb, as Shown in ANSI B16.1.

Bolt Circle and Holes Shall Be Compatible with Class 125 B16.1, or Class 150 ANSI B16.5 (Steel) Flanges.

Flanges Requiring Greater Pressures, Class 250 to Class 350, Shall Meet the Appropriated Standards with the Requirements Indicated on the Contract Drawings.

Unless Otherwise Shown on the Drawings, Pipe Shall Be Cement Mortar Lined in Accordance with the Requirements of Ansi/awwa C104/a21.4 Standard.

All Fabricated Flange Piping in Sizes 3" Through 24" Shall Be Manufactured from Components Manufactured of Ductile Iron, and must Meet All the Requirements Listed Above.

Flange Pipe Shall Have an Outside Coating of Primer.

F L A N G E J O I N T F I T T I N G S

Flanged Fittings in Sizes 3" Through 24" Shall Be Manufactured in Accordance with Ansi/awwa C110 A21.10, or to ANSI B16.1.

Fitting Shall Be Manufactured of Ductile Iron and Rated for 250-psi Water Working Pressure.

All Elbows or Bends (Straight Sizes), Tees, Crosses, Concentric Reducers, Base Elbows (Except Reducing Sizes), and Bottom Base Tees Are Manufactured to Ansi/awwa C110/a21.10 Standards.

Long Radius and Reducing Elbows, Reducing on the Run Tees, Size Outlet Fittings, Eccentric Reducers, and Laterals Are in Accordance with ANSI B16.1.

All Fittings Shall Be Drilled and Faced for 125 Lb Drilling Pattern, Unless Otherwise Shown on Drawings.

Fittings Shall Have Cement Mortar Lining, Except for Air Piping.

Fittings Shall Have a Primer Coating.

Flanged Fittings Shall Be Manufactured by Tyler or Union, and Shall Be in Strict Accordance with the above Specifications.

F L A N G E G A S K E T S A N D B O L T S

Flange Bolt and Gasket Kits Shall Be Furnished for Each Flange Joint Connection.

Flange Gaskets Shall Be Full Face Red Rubber, with a Minimum Thickness of 1/8". Gaskets Shall Be Manufactured of Styrene Butadiene Rubber.

Flange Bolts Shall Be Manufactured of Carbon Steel, per ASTM A307, or Stainless Steel, If Indicated on Drawings.

G A T E V A L V E S - R E S I L I E N T S E A T E D

Gate Valves in Sizes 2" Through 30" Shall Be Manufactured to Meet, and or Exceed, All the Requirements of AWWA C515 for Resilient Seated Ductile Iron Gate Valves.

Valves Shall Include the Following Specific Design Criteria:

- A) Valve Body Shall Be Manufactured of Ductile Iron and Have a Working Pressure of 250 Psi in All Sizes.
- B) All Ferrous Components Shall Be Ductile Iron, Body, Wrench Nut, Stuffing Box, and Valve Wedge.

- C) The Letters “Di”, or Words “Ductile Iron” Shall Be Cast into the Valve Body along with “250w” or “250 Psi”.
- D) The Valve Wedge Shall Be Ductile Iron, Encapsulated with Epdm Rubber, in Sizes 2” Through 30”. The Wedge Shall Be Symmetrical and Seal Equally Well with Flow in Either Direction.
- E) Valves Shall Have a Fusion Bonded Epoxy Coating Inside and out for Maximum Corrosion Resistance, Complying with Ansi/awwa C550 Applied Electrically Before Assembly.
- F) The Valve Shall Have a Smooth Full Diameter Waterway with No Recesses to Trap Debris or Obstruct Flow.
- G) Valve Stem Shall Be High Strength Corrosion Resistant Bronze. Stem Shall Be Sealed by Three O-rings. The Top Two O-rings Shall Be Replaceable with Valve Fully Open and While Subject to Full Rated Working Pressure. O-rings Set in a Cartridge Shall Not Be Allowed.
- H) Sealing Gaskets Shall Be Pressure Energized O-rings.
- I) Torque Minimizing Thrust Washers Located with (1) above and (1) below the Thrust Collar, Assuring Trouble Free Operation of the Valve.
- J) Gate Valves in Sizes 4” Through 12”, Shall Be (U.I.), Underwriters Laboratories Listed, and (F.M.), Factory Mutual Research Corporation Approved.
- K) Valves Shall Be Nsf Standard G1 Certified.
- L) Bolting Materials Shall Develop the Physical Strength Requirements of ASTM A307, and May Have Either Regular Square or Hexagonal Heads with Dimensions Conforming to ANSI B18.2.1. Metric Size Socket Head Cap Screws Are Not Allowed.
- M) Operating UB Shall Have Four Flats at Stem Connection to Assure Even Input Torque to the Stem.
- N) Flanged Valves in Sizes 3” Through 12” Shall Be O S & V 125 Lb. Flanges. Manufacturer Shall Be Able to Furnish 250 Lb. Flanges If Required.
- O) Valves 16” and Larger Shall Have an Enclosed Gear Case. Design Shall Be of the Bevel or Spur Gear Type, Dependent upon the Depth of Bury and Installation Conditions of the Valve.
- P) Valves and Hydrants Shall Be of the Same Manufacturer.

In Addition to All the above Requirements, the Pressure Ratings and Specifics of the above Conditions must Be Published in the Manufacturer Catalogs. The Manufacturer must Have Been Manufacturing Valves for at Least Twenty (20) Years, and Have a Ten (10) Year Warranty Against Defective Material and Workmanship.

V A L V E B O X E S

Valve Boxes for Valves 4" Through 30" Shall Be Manufactured of Cast Iron. They Shall Have a Minimum Wall Thickness of 1/4". The Clear Shaft Opening Shall Be Not less than 5 1/4".

Lids Shall Be Drop Type, Adjustable from 24 X 36, 36 X 48 as Required. When Greater Depths Are Encountered, the Use of Middle Piece Extensions Shall Be Required.

Boxes Shall Be of the Two Piece Design, with a Round Bottom.

All Pieces Shall Have a Protective Coating of Coal Tar Epoxy.

Valve Boxes Shall Be Screw Type as Manufactured by Tyler Pipe.

F I R E H Y D R A N T S

Fire Hydrants Shall Meet or Exceed AWWA C502, Latest Revision.

Fire Hydrants Shall Have a Rated Working Pressure of 200 Psi with a Test Pressure of 400 Psi.

Hydrant Shall Include the Following Specific Design Criteria:

A) The Main Valve Closure Shall Be of the Compression Type, Opening Against the Pressure and Closing with the Pressure.

B) Traffic Feature to Be Designed So That the Nozzle Section of the Hydrant Can Be Rotated (By Degree) to Full 360 Degree Circle During Field Installations If Necessary.

C) The Main Valve Opening Shall Not Be less than 5 1/4" and Be Designed So That Removal of Seat, Drain Valve Mechanism, Internal Rod, and All Working Parts Can Be Removed Through Top of Hydrant, Without Disturbing the Ground Line Joint or the Nozzle Section of the Hydrant.

D) Bronze to Bronze. The Bronze Seat Shall Be Threaded into Mating Threads of Bronze for Easy Field Removal.

E) The Draining System of the Hydrant Shall Be Bronze, and Activated by the Main Stem Without the Use of Auxiliary Rods, Toggles, Pins, Etc. The Drain Mechanism Shall Be Completely Closed after No More than Three Turns of the Operating Nut in the Opening Direction, Allowing Throttling of Hydrants as Needed. A Minimum of Two Inside Ports and Four Drain Port Outlets to the Exterior of the Hydrant, Insuring Positive Drain When Closed. Drain Shut-offs Shall Be by Direct Compression Closure.

F) The Operating Nut, Main Stem, Coupling, and Main Valve Assembly Shall Be Capable of Withstanding Input Torque of 200 Ft/lbs in Opening or Closing Directions.

G) Dry Top. There Shall Be an Internal Top Housing with Triple O-rings to Seal Operating Threads from the Waterway and Accommodate an Anti-friction Washer.

H) Nozzle Section of Hydrants Shall Be Designed to Permit Field Replacement of Damaged Threads Without Special Tools, Excavation, or Disturbing the Ground Line Joint. Bronze Nozzles Are to Be Locked into the Hydrant Barrel with Locking Lugs, and Be Sealed by Heavy-duty O-rings. Threading of Hose and Pumper Nozzles Shall Conform to the City of Brunswick's Specifications. Operating Nut Shall Conform to N.s.t. Specifications.

I) Hydrants Shall Comply with Both Factory Mutual Research Corporation, and Underwriters Laboratories U.I. 246 Standards.

J) Friction Loss Through Hydrant Shall Not Exceed 3 Psi at 1,000 Gpm Through the Pumper Nozzle. Above Flow Test and Certification of this Feature Shall Be Conducted by an Independent Testing Laboratory and Be in Accordance with AWWA C502, Latest Revision.

K) All below Ground Portions of Hydrants (Barrel & Shoe) Shall Be Manufactured of Ductile Iron.

L) Depth of Bury of Hydrants Shall Be 4ft., Ground Line Extensions Shall Be Available in 6" Increments Through 36". Contractors Shall Be Responsible for the Hydrant's Finished Grade.

Hydrants Shall Be as Manufactured by American Flow Control, Model B62-b, *or Kennedy Model K-81¹*.

¹Addition approved Mayor and Council, January 14, 2003.

M E C H A N I C A L J O I N T T A P P I N G S L E E V E S

Tapping Sleeves Shall Be the Split Type Mechanical Joint with Side and End Gaskets Manufactured of Ductile Iron.

Sleeves Shall Conform to All Applicable Requirements of Ansi/awwa C110 A21.10 Ansi/awwa C111 A21.11, and ANSI B16.11 Class 125 Flanges.

Sleeves Shall Be for Application on Cast or Ductile Iron as Required.

When Sleeves Are to Be Installed on Pipe That Is Larger than 12", Field Verification of Existing Pipe's Outside Diameter Shall Be Required by the Contractor Before Ordering Said Sleeve.

Sleeves Shall Be Similar to Those Manufactured by American Flow Control, or Approved Equal.

S T A I N L E S S S T E E L T A P P I N G S L E E V E S

Stainless Steel Tapping Sleeves Shall Be Manufactured of 304 Heavy Gauge Stainless Steel.

Sleeve Shall Be a Split Type TIG Welded and Fully Passivated. It Shall Have a Two-piece Design Featuring TIG Welded 304 S.S. 5/8 N.C. Thread and Heavy Hex Nuts and Bolts.

Bolt Threads Shall Be Coated to Prevent Galling, and Be TIG Welded to Prevent Loss. Sleeve Shall Have a S.S. Lifter Bar Allowing a Positive Locking Hold, and Easy Assembly.

Sleeves Shall Incorporate a Full Circumferential Gasket Seal for Positive Pressure Sealing. The Gasket Shall Be of Virgin SBR Compound for Water Service.

Sleeve Shall Be Applicable for Installation on A.c., P.v.c. SDR Sizes, P.v.c. C900 Sizes, Ductile Iron, or Cast Iron Piping Systems.

A ¾" N.p.t. Test Plug for Test Shall Be Incorporated in Each Sleeve.

Flanges Shall Be Manufactured of Carbon Steel.

Sleeves Shall Be Similar to Fast as Manufactured by the Ford Meter Box Co., Inc.

The Use of Stainless Steel Tapping Sleeves Shall Not Be Allowed on a Size on Size Application and Only by Written Permission by the Director of Public Works.

C H E C K V A L V E S — R E S I L I E N T S E A T E D

Swing Check Valves in Sizes 4" Through 12" Shall Be Manufactured in Accordance with AWWA C508 Resilient Seated Design. Valves Shall Be Manufactured of Ductile Iron Meeting or Exceeding ASTM A536 65-45-12 and Rated for 250-psi Cold Water Working Pressure.

Valves Shall Have a Ductile Iron Disc Fully Encapsulated with Epdm Rubber. The Disc Travel to Closure Shall Not Be More than 35 Degrees and Shall Seal Drop Tight at Pressures above 5 PSIG.

Valves Shall Be Coated with Fusion Bonded Epoxy on All Internal and External Ferrous Surfaces. The Valve Shall Be So Designed as That the Disc Shall Be the Only Allowable Moving Part and Said Disc Shall Be Reversible So Either Side Will Seal Equally. The Valve Shall Have 100% Unobstructed Flow Area Free of Pockets and Voids.

A Factory Installed Back Flushing Actuator Can Be Furnished as an Option for Priming Pumps, Back Flushing, Draining Lines, and System Testing. Options Shall Be Shown on Drawings and or Bid Items.

Valves Shall Be Equal to American Flow Control Series 2100 Ductile Iron Resilient Seated Check Valve.

A I R A N D V A C U U M V A L V E S

Combination Air Release and Air Vacuum Valves Shall Have Cast Iron Bodies with Stainless Steel Floats. Other Internal Parts Shall Be Either Stainless Steel or Bronze.

Valves Shall Be Sized Appropriately for Each Application. Valves for Lines 3" Through 8" Shall Be 1" as Manufactured by Val-Matic, Model No. 201 C, or Approved Equal. Valves for Lines 10" Through 24" Shall Be 2" as Manufactured by Val-Matic, Model No. 202 C, or Approved Equal.

Installation Shall Be per Detail Drawing.

S A M P L I N G S T A T I O N S

Sampling Stations (Figure Wo6) Shall Be 4' Depth of Bury, ¾" F.i.p. Inlet and a ¾" Hose or Un-threaded Nozzle. All Stations Shall Be Enclosed in a Lockable, Non-removable, Aluminum-cast Housing. When Opened, the Station Shall Require No Key for Operation, and the Water Will Flow in an All Brass Waterway. All Working Parts Will Also Be of Brass, and Be Removable from above Ground with No Digging. A Copper Vent Tube Will Enable Each Station to Be Pumped Free of Standing Water to Prevent Freezing and to Minimize Bacteria Growth.

Contractor Shall Supply One Pump (S) for Every Two-sampling Station (S) Installed.

The Exterior Piping Will Be Galvanized. Sampling Stations Shall Be as Manufactured by Kupferle Foundry, or Approved Equal.

Installation Shall Be per Detailed Drawing.

B R A S S F I T T I N G S A N D P I P E

All Threaded Fittings and Pipe for Buried Service Shall Be Manufactured from Brass, Meeting ANSI B16.15 Specifications.

Brass Fittings Shall Be So Designed and Manufactured to Provide Full Flow with Minimum Restrictions.

All Threads Shall Be Accurately Machined and Gauged to Insure a Perfect Fit with Pipe.

Nipples Shall Be Available in Various Lengths as Required.

B A L L C U R B S T O P S

Curb Stops in Sizes ¾" Through 2" Shall Be the Ball Type Manufactured from Water Works Brass Containing 85% Copper, 5% Tin, 5% Lead, and 5% Zinc.

The Ball Shall Be Fluorocarbon Coated Brass, Seating Against Buna-n-rubber Seats.

Valves Shall Be Water Tight Against Flow in Either Direction.

The Stem Shall Be Held in Place by a Bronze Ring, and Shall Exert No Other Force on It, Except to Open or Close the Ball Valve.

Each Valve Shall Have a Substantial T-head for the Operation of Opening and Closing with a $\frac{1}{4}$ Degree Turn of a Standard Slotted Tee Handle Curb Wrench.

Stops or Lugs for Controlling the Motion of the T-head Shall Be Enclosed and Properly Positioned to Line up the Waterway Through the Ball with the Water Passage Through the Valve Body.

Stem Seals Shall Consist of Two (2) O-rings.

For Curb Valves in Sizes $\frac{3}{4}$ " the End Connections Shall Be Compression P.j. Copper.

When Curb Valves Are Used as Blow-off Valves, the End Connections Shall Be 2" F.i.p.

Ball Curb Valves Shall Be Manufactured by Ford Meter Box Co., Inc.

R O A D W A Y V A L V E B O X E S

Valve Boxes for Valves 1 $\frac{1}{2}$ " Through 3" Shall Be Manufactured of Cast Iron Have a Minimum Wall Thickness of $\frac{1}{4}$ ". The Clear Shaft Opening Shall Be Not less than 4 $\frac{1}{2}$ ".

Lids Shall Be Drop Type, Adjustable from 36" X 48" as Required. When Greater Depths Are Encountered, the Use of Middle Piece Extensions Shall Be Required.

Boxes Shall Be of the Two Piece Design, with an Arched Bottom.

All Pieces Shall Have a Protective Coating of Coal Tar Epoxy.

Valve Boxes Shall Be Screw Type as Manufactured by Tyler Pipe.

S E R V I C E P I P I N G

Service Tubing in Sizes $\frac{3}{4}$ " Through 2" Shall Be Type "K" Copper Tubing, Conforming to ASTM Specifications B88.

Wherever Feasible, Service Lines Shall Be One Continuous Piece from the Corporation Stop to the Meter Setting.

S E R V I C E L I N E F I T T I N G S

Service Line Fittings Shall Be Manufactured from AWWA C800 Red Brass of 85-5-5-5 Alloys.

For Copper Tubing, Fittings Shall Be Compression Pack Joint Type.

For Galvanized Steel Pipe, They Shall Be Compression Type. Compression Nuts for Galvanized Steel Pipe Will Not Be Grooved, but Shall Be Tapped for a Stainless Steel Set Screw.

For Copper Tube Size (CTS) and Iron Pipe Size (Ips) Poly Tubing They Shall Be Compression Type.

Compression Joint Shall Consist of a Compression Nut Sealed by a Beveled Buna-n Gasket Locked in Place by a Stainless Steel Set Screw.

Compression Nut for C.t.s., I.p.s., and Copper Tubing Shall Be Machined with Grooves in a Split-clamping Device for Gripping Tubing and Tapped for a Stainless Steel Slotted Set Screw.

All Fittings Shall Be So Designed as to Permit Full Continuity on Metal Tubing or Galvanized Pipe.

When Poly Tubing Is Installed, Stainless Steel Insert Stiffeners Shall Be Used.

Refer to Service Tubing Specifications and or Plans for Type and Size of Service Lines Required.

Certifications of Compliance with AWWA C800 Shall Be Required on All Service Line Equipment.

Fittings Shall Be Similar to Those Manufactured by the Ford Meter Box Co., Inc.

C O R P O R A T I O N S T O P S

Ball Corporation Stops Shall Be of the Ball Valve Type. The Ball, Stem, Nut, and Body Shall Be of a Red Brass Containing 85% Copper, 5% Tin, 5% Lead, and 5% Zinc. The Ball Shall Be Fluorocarbon Coated and Shall Be Held in Position By, and Seal Against, Seats of Buna-n Rubber. Seats Shall Be Secured in Place by an Epoxy Adhesive.

Corporation Stops Shall Be Designed to Create Minimum Resistance to Flow. The Waterway Shall Be No Smaller than the Nominal Size of the Valve. Valves Shall Be Watertight at Any Pressure up to 300 Psi.

Each Stop Shall Be Designed So That They May Be Installed in Mains under Pressure Using Standard Tapping Machines.

Corporation Stops in Sizes ¾" Through 2" Shall Be Available from the Same Manufacturer.

Corporation Stops Shall Have Threads Conforming to AWWA Standard C800. The Inlet Threads Shall Be AWWA. The Outlet Connections Shall Be Compression Pack Joint Copper.

Ball-corp Corporation Stops Shall Be as Manufactured by the Ford Meter Box Co., Inc. of Wabash, In.

S E R V I C E S A D D L E S

Service Saddles for Ductile Iron Pipe, When Required, Shall Be Manufactured of Ductile Iron According to ASTM A536.

Saddles Shall Be Double Strap Type, with Straps Manufactured of Zinc Plated Steel with Dichromate Seal.

Gaskets Shall Be Buna-n Rubber, According to ASTM D2000 80 Ms Bg506.

Outlet Shall Be Tapped with AWWA Threads.

Saddles Shall Be Similar to Ford Series F-202 as Manufactured by the Ford Meter Box Co., Inc.

S P E C I F I C A T I O N S F O R C O L D W A T E R M E T E R S ²

Displacement Type-Magnetic Drive-5/8" through 2"

SCOPE All meters furnished shall be produced from and ISO 9001 manufacturing facility and conform to the "Standard Specifications for Cold Water Meters"-C700, latest revision issued by AWWA or ad otherwise stated.

TYPE Only magnetic driven, positive displacement meters of the flat nutating disc type will be accepted because of enhanced low flow accuracy performance.

SIZE, CAPACITY, LENGTH The size, capacity and meter lengths shall be as specified in AWWA Standard C700 latest revision. The maximum number of disc nutations is not to exceed those specified in AWWA C700 latest revision, Sec. 4.2 Registration, Table 1.

All meter maincases shall be made of a lead-free brass containing a minimum of 85% copper, such as Envirobrass II, that meets NSF 61 standard. The serial number should be stamped between the outlet port of the maincase and the register. Maincase markings shall be cast raised and shall indicate size, model, direction of flow and NSF 61 certification. Plastic maincases are not acceptable.

Meters for 5/8", 3/4" and 1" shall be of the removable bottom cap type with the bottom cap secured by four (4) bolts on 5/8" and 3/4" sizes and six (6) bolts on the 1" size. Intermediate meter maincases shall also be made of the same lead-free brass material in sizes 1-1/2" and 2" type with an upper top plate secured to the maincase with eight (8) bolts, a screw on design shall not be accepted. Meters with a frost plug, screw on or no bottom cap shall not be accepted in 5/8"-1" sizes. 5/8" meters shall have a synthetic polymer or cast iron bottom cap.

All lead-free brass maincases shall be guaranteed free from manufacturing defects in workmanship and material for the life of the meter.

All meters must be adaptable to a field programmable absolute encoder type register without interruption of the customer's service.

BOLTS All maincase bolts shall be of 300 series non-magnetic stainless steel to prevent corrosion.

DIRECT READ STANDARD REGISTER The register shall be of the straight reading sealed magnetic drive type; and shall contain six (6) numeral wheels. Registers must be roll sealed and dry. All direct reading register cups shall be copper to prevent corrosion and be covered with a high strength, impact resistant flat glass lens to prevent breakage. The lens shall be positioned above the register box to allow for run off of debris. The register lid shall overlap the register box to protect the lens. The register retaining ring shall be designed to absorb impact from the register. Register boxes and lids shall be of high strength synthetic polymer or approved equal. All registers shall have the size, model and date of manufacture stamped on the dial face. The dial shall have a red center sweep test hand and shall contain 100 equally divided graduations at its periphery.

The register must contain a low flow indicator with a 1:1 ratio to disc nutations to provide leak detection.

Registers shall be secured to the maincase by means of a plastic tamperproof seal to allow for inline service replacement. Register seal screws are only accepted when supplied with attached sealing wire to at least one bottom cap bolt with seal wire holes of not less than 3/32" in diameter.

Registers shall be guaranteed for at least 10 years. All meters will be guaranteed for one year on material and workmanship.

MEASURING CHAMBER The measuring chamber shall be of a 2-piece snap-joint type with no fasteners allowed. The chamber shall be made of NEPTON 313, a non-hydrolyzing synthetic polymer. No screws shall be used to secure the chamber together.

The control block shall be the same material as the measuring chamber and be located on top of the chamber. The control block assembly shall be located after the strainer.

The measuring chamber outlet port shall be sealed to the maincase outlet port by means of an "O" ring gasket.

The flat nutating disc chamber shall be of the one piece and made from non-hydrolyzing synthetic polymer, and shall contain a type 316 stainless steel spindle. The nutating disc shall be equipped with a synthetic polymer thrust roller located within the disc slot. The disc slot shall be located on the diaphragm. The roller head shall roll on the buttressed track provided by the diaphragm in the measuring chamber near the chamber outlet port.

The chamber shall be warranted for 10 years against freeze damage if the meter has been equipped with a frost proof cast iron or synthetic polymer bottom cap.

STRAINERS All meters shall contain removable polypropylene plastic strainer screens. The strainer shall be located near the maincase inlet port, before the measuring chamber and control block assembly. The strainer shall also function as the device that holds the measuring chamber in place within the maincase. Straps or other types of fasteners shall not be accepted.

PERFORMANCE To ensure accuracy, each meter must be accompanied by a factory test tag certifying the accuracy at the flows required by AWWA C700 (low, intermediate, and full flow).

All meters shall be warranted as follows:

Low Flow Low Flow

<u>Size</u>	<u>Low Flow</u>	<u>New Meter Accuracy</u>	<u>Repaired Meter Accuracy</u>
5/8"	1/8 gpm@95%	5 yrs. or 500,00 gal	5-10 yrs. or 1,500,000 gal
3/4"	1/4 gpm@95%	5 yrs. or 750,00 gal	5-10 yrs. or 2,300,000 gal

1"	3/8 gpm@95%	5 yrs. or 1,000,000 gal	5-10 yrs. or 3,000,000 gal
1-1/2"	3/4 gpm@95%	1 yr.	1 yr.
2"	1 gpm@95%	1 yr.	1 yr.

Normal meter operating range shall be warranted per AWWA C700 Section 4.2 Table 1.

Size Range (100+/- 1.5)

5/8"	1/2-20 gpm
3/4"	3/4-30 gpm
1"	1-50 gpm
1-1/2"	2-100 gpm
1"	2-1/2"-160 gpm

MANUFACTURER Meters and meter parts shall be manufactured, assembled, and tested within the Continental United States. Manufacturers may be required to provide proof of where and of what percentage of the meter register, chamber, and maincase is manufactured as per specified.

Manufacturers shall have a minimum of fifteen years of field and production experience with all sizes of the model quoted for model standardization. Manufacturers shall provide only one model of meter which complies with these specifications. Meter suppliers must have been manufacturing meters for at least 100 years.

SYSTEMS GUARANTEE All meters shall be guaranteed upgradeable to the following systems without interruption of the customer's service.

Autodetect Absolute Encoder
R-900
Flo-Search II
Tricon III
Inbound Telephone
Cellnet

W A T E R M E T E R Y O K E S E T T I N G

Meter Settings (Figure Wo7) for 5/8" Through 1" Meters Shall Consist of a Cast Iron Bracing Yoke Bar Combined with Water Works Brass Inlet and Outlet Pieces, and a Three Piece Expansion Wheel, Designed to Lock and Hold the Water Meter in Place. All Brass to Be Manufactured to AWWA Standard C800 Red Brass of 85-5-5-5 Alloys.

Inlet Shall Consist of an Angle Yoke Ball Valve with Padlock Wings.

Outlet Shall Consist of an Angle Yoke Dual Cartridge Check Valve (ASSE Approved). Angle Dual Cartridge Check Valves Shall Carry ASSE Approval under Standard 1024 and Meet or Exceeds All Requirements of the Standard. It Shall Consist of Two Individual Cartridge Check Valves and Shall Be So Designed to Deter Backflow Even If One Cartridge Is Removed.

The Design Shall Permit Maintenance Inspection or Replacement Without the Use of Special Tools and Without Disturbing the Water Meter Service Line Plumbing.

Valve Shall Be Equipped with a Top Test Valve.

Outlet Shall Consist of an Angle Yoke Dual Check Valve ASSE Approved under Standard 1024 and Meet or Exceeds All Requirements of That Standard.

Valves Shall Be Equipped with Test Valve.

All Yokes and Pieces Shall Be of the Same Manufacturer.

All Yokes and Pieces Shall Be of the Same Manufacturer.

Pieces Shall Be as Follows:

5/8 Inch

Yoke Valve—ball	Part Number—ba94-213w
Yoke Wheel—Excon	Part Number—ec1
Yoke Bar—cast Iron	Part Number—y501
Yoke Outlet—dual Check	Part Number—hhca94-323td

1 Inch

Yoke Valve—ball	Part Number—ba94-444
Yoke Valve—Excon	Part Number—ec4
Yoke Bars—cast Iron	Part Number—y504
Yoke Outlet—dual Check	Part Number—hhca94-313td

D U A L C A R T R I D G E C H E C K V A L V E

Angle Dual Cartridge Style Check for Use in Meter Setting Equipment must Have the Following Design Characteristics:

Valve Design Shall Consist of Two Independent Cartridge Check Valves Mounted in Line for Maximum Protection of Backflow and Ease of Maintenance.

Each Valve must Carry the ASSE 1024 Approval.

The Manufacturer must Be Able to Provide a Full Range of ¾" and 1" Dual Cartridge Style Checks for Meter Settings.

The Same Manufacturer as the Setter or Yoke must Manufacture Each Valve.

Valve Bodies must Be Manufactured from Red Brass Conforming to AWWA C800 Standards.

Valves must Be Able to Attach Directly to the Outlet of Specified Water Meter.

Cartridges Shall Be Removable for Inspection and Replacement Through the Top of the Dual Check, Accessible via a Removable Sealed O-ring Threaded Cap.

The Design must Facilitate the Removal of Each Cartridge Without the Need for Special Tools.

Each Cartridge Shall Be Identical in Design to Allow Interchanging of Checks and Dismiss the Possibility of Faulty Installation.

There Shall Be an O-ring Seal Between the Outside of Each Check Cartridge to Seal Against the Inside of the Valve Body.

Cartridge Check Assemblies Shall Be Manufactured of Acetyl Plastic with Stainless Steel Springs.

For ¾" Valves the P.s.i. Drop must Be No More than 8.5 P.s.i. at 15 G.p.m.

For 1" Valves the P.s.i. Drop must Be No More than 7 P.s.i. at 25 G.p.m.

The Manufacturer, must upon Request, Submit a Notarized Certification of Conformance to the above Material Standards.

W A T E R M E T E R C U S T O M S E T T E R S

Custom Meter Setters for 1 ½" and 2" Meters Shall Be Equipped with the Following Features:

Setters Shall Be Provided with a Ball Valve with Padlock Wings. The Outlet Shall Have a Dual Check.

Optional Features of Bracing Eye, Seal Holes, Padlock Wings, and Metter Support Brackets Shall Be Furnished on Each Setter.

The Height of the Setter Shall Be 15".

Setters Shall Have Type K Copper Tubing Sized to Allow a Full Flow to and from the Meter.

The Inlet Connection Shall Be F.i.p. with an Outlet Connection of F.i.p.

Each Setter Shall Have a Built-in By-pass Valve and Piping Located at the Base of Each Setter. The Valve Shall Be a Ball Valve Equipped with Padlock Wings.

Two-inch Setters Shall Be Vbhh77-15bhc-11-77, and One and One Half Setters Shall Be Vbhh76-15bhc-11-66 as Manufactured by the Ford Meter Box Co., Inc.

M E T E R B O X C O V E R S

Meter Box Covers for 5/8' Through 1" Meter Settings Shall Be Cast Iron Recessed Style Locking Lids with Standard Pentagon Nuts.

Lid Shall Be 18" Inside Diameter with an 11 1/2" Lid and a 4" Depth.

Lid Shall Have a Standard Bronze Pentagon Nut and Bolt with a Hard Cast Iron Locking Worm.

Lid Shall Be Similar to the Ford Meter Box Co., Inc., Style, Pa32tpwc.

Meter Box Covers for 1 1/2" and 2" Meters Shall Be Monitor Covers Mc36t. Light Traffic Shall Be Mc36t with RML 12-t.

M E T E R B O X C O V E R E X T E N S I O N R I N G S

Meter Box Cover Extension Rings, for Use with 24" X 30" Diameter Meter Boxes, Shall Be Made of Cast Iron.

Standard Meter Box Frames and Covers Shall Be Used in Conjunction with Extension Rings to Extend the Diameter of Meter Boxes to Accommodate Meter Setting Requirements.

Extension Rings Shall Be Similar to the Ford Meter Box Co., Inc. Style.

M E T E R B O X E S

Meter Boxes Shall Be Manufactured from a High Density Polyethylene with a Minimum Material Density of .950 G/cc per ASTM D-1505.

Boxes Shall Be of One-piece Molded Construction, Incorporating an Insulation Layer in the Molded Wall to Resist Frost Jump.

The Nominal Wall Thickness Shall Be Not less Than .500.

Meter Boxes Shall Have a Minimum Thermal Transfer Value of 4.0 According to ASTM C-171, Allowing for Maximum Insulating Factors.

Each Box Shall Incorporate a Molded Shelf Located Inside Each Box Approximately Three Inches from the Top to Accommodate an Insulation Pad as Required.

The Vertical Load, Freestanding, Shall Be a Minimum of 26,000 Lbs. The Horizontal Load Shall Vary According to the Diameter of the Box, with a Minimum of 180 Lbs., and a Maximum of 240 Lbs.

Boxes Shall Have a Top Flange for Cover Seating and an Anti-settling Flange on the Bottom.

All Edges Shall Be Clean and Smooth, Interior and Exterior, to Prevent Frost Heaves.

The Interior Shall Be Bright White in Color for Light Reflection to Ease Meter Reading.

The Exterior Shall Be Black in Color to Retard U.v. Degradation I

Adjust to Grade Box Extensions Shall Be Available from the Manufacturer in Heights of 3", 6", and 12" in Most Common Diameter Boxes.

Tapered Risers Shall Also Be Available to Accommodate Sloping Installations.

Manufacturer Shall Be Able to Furnish a Wide Range of Boxes, Ranging in Diameters from 15" Through 36", with Depths of Bury from 18" Through 48".

The Particular Applications Shall Be as Follows:

18" X 30" for 5/8" Water Meters.

24" X 30" for 1" Water Meters.

36" X 36" for 1 ½" and 2" Water Meters.

Meter Boxes Shall Be Manufactured by Mid-states Plastics, Inc.

GENERAL MATERIAL

SEWER

SEWER MAINS

Polyvinyl Chloride (PVC) Sewer Pip in Sizes 8" Through 27" Shall Meet the Requirements of ASTM D3034 and Uni-bell Uni-b4.

The Standard Dimension Ratio (SDR) of All Pip Shall Be SDR 35.

Standard Lengths Shall Lay Not less than 12.5 Feet \pm 1 Inch Except for Manhole Stubs.

All Joints Shall Be of the Bell and Spigot Type, and Conform to ASTM D3212 And/or Uni-b-1.

Gaskets Shall Be in Accordance with F477. All Bells Shall Be Formed Integrally with the Pipe and Shall Contain a Factory Installed Elastometric Gasket.

No Solvent Cement Joints Will Be Permitted in Field Construction, Except as Specifically Authorized by the Director of Public Works.

Physical and Chemical Tests Shall Be Performed in Accordance with the Referenced ASTM Specifications, and Shall Be Conducted at $73^{\circ}\text{f} \pm 3^{\circ}\text{f}$.

Deflection Shall Not Exceed 7%.

Certifications of Compliance of the above Specifications Shall Be Required from the Manufacturer Before Acceptance of Delivery or Award of Contract.

LATERAL PIPING

Polyvinyl Chloride (PVC) Pipe in Sizes 4" Through 6" for Use in Lateral Piping Shall Meet the Requirements of SDR 35. Reference Figure So5-so8.

PVC Lateral Fittings Shall Meet the Requirements of SDR 35 in Sizes of 4" Through 6".

S E W E R M A I N F I T T I N G S (P V C)

Polyvinyl Chloride (PVC) Pipe Fittings in Sizes Through 27" Shall Conform to the Requirements of ASTM D-3430.

All PVC Sewer Pipe Fittings must Utilize the Bell and Spigot Concept with the Utilization of a Single Sealing Synthetic Rubber Gasket Provided by the Manufacturer.

1. All Sewer Main Fittings Shall Meet the Following Requirements:
2. ASTM D-3034 – Fittings
3. ASTM D-1784 – Materials
4. ASTM D-3212 – Joints
5. ASTM F-477 - Gaskets
6. Wall Thickness – SDR 35

Sewer Main Fittings Shall Be Made from PVC Compounds as Defined and Described in ASTM Designations D-1784 for Rigid PVC Compounds and All PVC Fittings Supplied Shall Have the Following Markings:

1. Manufacturers Name or Trademark
2. Nominal Size
3. Material Designation
4. ASTM Designation

PVC SDR 35 Fittings in Sizes 4" Through 8" Shall Be Manufactured by the Injected Molding Process.

PVC Ser 35 Fittings in Sizes 10" Through 27" Shall Be Manufactured by the Factory Fabricated Process.

The Minimum Bell Depth on the above Mentioned Fittings Shall Be as Specified per ASTM D-3032, Section 6.2 and 7.3.2 4" Through 8", and Section 7.11 on 10" and Larger, as Shown in the Following Sizes:

4"	1.75"
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6"	3.00"
8"	4.00"
10"	5.00"
12"	6.00"
15"	7.5"
18"	Manufacturers Pipe Bell
21"	Manufacturers Pipe Bell
24"	Manufacturers Pipe Bell
27"	Manufacturers Pipe Bell

Sealing Gaskets Shall Have Minimum Cross Section Area of 0.20 Square Inch.

Fittings Shall Be So Designed as to Have a Minimum Load Resistance on an 8 X 6 Wye of 900 Lbs. At a Deflection of 5%.

Certifications of Compliance to the above Specifications Shall Be Required.

D U C T I L E I R O N P I P E

Ductile Iron Pipe Shall Be Manufactured in Accordance with the Requirements of Ansi/awwa C151/a21.51. Push-on Joints and Mechanical Joinings for Such Pipe Shall Be in Accordance with Ansi/awwa C111/a21.11.

Pipe Thickness Shall Be Designed in Accordance with Ansi/awwa C150/a21/50, and Shall Be Based on Laying Conditions and Internal Pressure.

Wall Thickness for 4" Through 12" Shall Be C152.

Wall Thickness for 14" Through 25" Shall Be C151.

Pipe Shall Be Cement Mortar Lined in Accordance with Ansi/awwa C104/a21/4 Double Thickness.

Laying Lengths Shall Be Either 18 Ft or 20 Ft Nominal Lengths.

Pipe Larger than 14" Shall Be Shipped with an Appropriate Percentage of Fully Gauged Pipe to Facilitate Fitting Requirements.

Ductile Iron for Use as Restrained Joint Shall Be Mechanical Joint Pipe Using Uni-flange Joint Restraining Glands. Pipe Shall Be Used as Indicated on Drawings or Details.

Wall Thickness for 4" Through 12" Shall Be C152.

Wall Thickness for 14" Through 24" Shall Be C151.

M E C H A N I C A L J O I N T F I T T I N G S

Mechanical Joint Fittings in Sizes 4" Through 24" Shall Meet the Requirements of AWWA C153.

Fitting Shall Be Manufactured from a High Strength, Impact Resistant Ductile Iron, Having a Minimum Tensile of 70,000 Psi with a Minimum Yields of 50,000 Psi and a Minimum Elongation of 5%.

Fitting Wall Thickness Shall Be C154 Through 23" Diameters and C156 Through 24" Diameters.

Fittings Shall Be Rated at 350 Psi.

Cement Lining – All Accessories, Glands, Bolts, and Gaskets Shall Conform to ANSI A21.11 AWWA C111 Latest Revision.

Fitting Shall Be Listed with Underwriters Laboratories.

All Fittings must Be Manufactured Domestically.

Where Fittings Are to Used with PVC Piping Systems, Appropriate Gaskets Shall Be Furnished If Required.

Tees Shall Be Used for Lateral Connections.

Fittings Shall Be as Manufactured by Tyler Pipe, Union, or Approved Equal.

M A R K I N G T A P E - N O N - D E T E C T A B L E

Non-detectable Warning and Identification Tape

Composition of Tape Shall Be Polyethylene and Have a Film Thickness of 4.0 Mil. Nominal and Width of 6".

Color Shall Be Bright Green with Black Printed Letters on One Side Stating, "Caution - Sewer Line Buried Below."

Tape Shall Be 6" as Manufactured by Pro-line or Approved Equal.

Said Tape Shall Be Installed Two Feet above Pipelines. This Tape Shall Be Installed in Conjunction with Main Lines, Including Service Connections.

S E W E R S A D D L E S

Ductile Iron Sewer Saddles Shall Be Manufactured of Ductile Iron Meeting ASTM 536 Grade 65-45-12. Iron Body Shall Be Prime Coated.

Saddle Straps Shall Be Manufactured of Stainless Steel per ASTM A240 Type 304, 3 ½" Wide.

Bolts Shall Be Stainless Steel per ASTM A193 Type 304 ½" N.c. Rolled Thread, Teflon Coated. Reference Figure So9.

Nuts, Shall Be Stainless Steel, per ASTM A194 Type 304.

Washers Shall Be Stainless Steel, per ASTM A240 Type 304.

Saddle Gasket Shall Be Virgin SBR per ASTM D2000 MBA 710, Compounded for Water and Sewer Service.

Saddles Shall Be Available with 4" and 6" Outlets Designed to Accept PVC Through Clay as Required.

The Gasket Shall Be Able to Conform Itself to the Existing Pipe and Provide a Positive Seal Against Infiltration.

In Sizes above 24", a Gasket Shall Be Provided in Addition to the Standard Gasket to Accomplish an Adequate Seal.

Straps Shall Be Available in Three (3) Sizes, Dependent upon Specific Requirements to Accommodate Pipe Diameters from 6" Through 27".

Saddles Shall Be Similar to Romac Industries C.v., or Equal.

M A N H O L E F R A M E S A N D C O V E R S

Castings Shall Be Manufactured True to Pattern. Component Parts Shall Bit Together in a Satisfactory Manner. Castings Shall Be Smooth and Well Cleaned by Shot Blasting.

Metal Shall Be Astm-a-48 Class 35b Gray Iron Minimum, or Astm-a-536 Grade 80-55-06 for Ductile Iron.

Castings Shall Have a Minimum Tensile Strength of 35,000 Psi, H2O Loading.

Watertight Castings Shall Be Furnished Wit a Bolt down Lid and Gasket, Model Number Neenah R1916.

Standard Castings Shall Be Furnished with a Compression Sealing Gasket, Model Number Neenah R1642. Refer to Figures So1-so4.

P R E S S U R E S E W E R

PVC Molecular Oriented Pipe Shall Be Manufactured to Conform to the Following Standards: AWWA C909

- 1) ASTM F1483 – Standard Specification for Oriented Poly Vinyl Chloride Pvco Pressure Pipe.
- 2) ASTM D1784 – Standard Specification for Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds.

- 3) Performance Requirements Standard Specification for Poly Vinyl Chloride (PVC) Pressure-treated Pipe (SDR Series).
- 4) ASTM D3139 – Standard Specification for Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals.
- 5) ASTM D2774 – Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
- 6) Uni-b-1 – Recommended Specification for Thermoplastic Pipe Joints, Pressure and Non-pressure Applications.
- 7) Nsf Standard No. 61 – Drinking Water System Components – Health Effects.
- 8) Pvco Pressure Pipe Shall Be Rated for 150 Psi with a Safety Factor of 4 to 1.
- 9) Pvco Shall Have a Minimum Hydrostatic Design Basis (Hdb) of 1700 Psi.
- 10) Pvco in Sizes 6" Through 12" Shall Have Outside Diameter of Ductile Iron Pipe, and Shall Require No Special Repair Material, Tapping Material, Other than What Is Currently Being Utilized.

Pipe Shall Be as Manufactured by E.t.i Uponor, Inc.

P V C P R E S S U R E P I P E

PVC Pressure Pipe Shall Be Manufactured to Steel Pipe Size (Ips) Outside Dimensions with Dr's and Tolerances in Compliance with ASTM D2241 PVC Plastic Pipe, Dr. and Pr.

Pipe Shall Be Manufactured to Steel Pipe O.d.'s (Ips) in Size 1 ½" Through 4". Pipe Shall Be Joined by Means of a Rubber Ring Bell Joint, Which Shall Be an Integral and Homogeneous Part of the Pipe.

Pipe Shall Conform to All Requirements of ASTM D2214 for PVC Pipe.

Pressure Ratings and Class Shall Be as Indicated on Drawings. If Drawings Do Not Show Class, the Highest Class Shall Be Required.

Pipe Shall Have a Two to One (2 to 1) Safety Factor with Class and Sdr's as Follows:

SDR 21

CI200

When Used for Potable Water Systems, Pipe Shall Bear the N.s.f Seal.

The Following Astm's Shall Be Required:

ASTM D1784 PVC Compound

ASTM D2214 PVC Standard Specifications

ASTM D3139 Joints for PVC Pressure Pipe

Uni-b-1 Thermoplastic Pipe Joints

Certificates of Compliance of the above Specifications Shall Be Required from the Manufacturer Before Acceptance of Delivery or Award of Contract.

S C H E D U L E 8 0 P V C P I P E A N D F I T T I N G S

All Schedule 80 PVC Pipe Shall Conform to ASTM D1785 Classification, Material Conforming to 12454-b, and Be Gray in Color.

Schedule 80 PVC Pipe Fittings Shall Be Manufactured in Conformance with ASTM D2464 Specification, Material Conforming to 12454-b, and Shall Be Threaded; with the Following Exceptions:

1. Socket Wall Thickness over the Threads, of Threaded Type Fittings, Shall Be a Minimum of 25% Greater than the Thickness of the Schedule 80 Pipe.
2. Body Wall Thickness Shall Be 50% Greater than the Thickness of the Schedule 80 Pipe.

All Threads Shall Be Machine Tapped Conforming to ANSI Specification B2.1.

The "Quick Burst" Strength of the Fittings Shall Be Equal or Exceed the "Quick Burst" Strength of the Equivalent Schedule 80 PVC Pipe.

Pipe and Fittings Shall Be as Manufactured by R&g Sloan Mfg. Co., Inc.; Flow Control, Inc.; or Equal.

M E C H A N I C A L J O I N T F I T T I N G S

Mechanical Joint Fittings in Sizes 4" Through 24" Shall Meet the Requirements of AWWA C153.

Fittings Shall Be Manufactured from a High Strength, Impact Resistant Ductile Iron, Having a Minimum Tensile of 70,000 Psi with a Minimum Yield of 50,000 Psi and a Minimum Elongation of 5%.

Fitting Wall Thickness Shall Be C154 Through 12" Diameters and C156 Through 24" Diameters.

Fittings Shall Be Rated at 350 Psi.

Cement Lining – All Fittings Shall Be Cement-lined in Accordance with ANSI A21.4 – AWWA C111 – Latest Revision.

Fitting Shall Be Listed with Underwriters Laboratories.

All Fittings must Be Manufactured Domestically.

Where Fittings Are to Be Used with PVC Piping Systems, Appropriate Gaskets Shall Be Furnished If Required.

Fittings Shall Be as Manufactured by Tyler/union or Approved Equal.

P V C G A S K E T E D P R E S S U R E F I T T I N G S

PVC Gasketed Pressure Fittings in Sizes 1 ½" Through 4" Shall Be Manufactured of PVC Compounds Meeting ASTM D1784.

Fittings Shall Be One Piece Injection Molded in Sizes Available. When Certain Sizes Are Not Available, Factory Fabricated Pressure Fittings Shall Be Acceptable.

Bells Shall Be Gasketed Joint, Conforming to ASTM D3139, with Gaskets Conforming to ASTM F477.

Fittings Shall Be N.s.f. Approved. All Fittings Shall Have a Working Pressure of 200 Psi.

All Fittings Shall Be Compatible with PVC Pipe, Having an O.d. of Steel Pipe.

Fittings Shall Be as Manufactured by the Harrington Corporation.

D E T E C T A B L E W A R N I N G A N D I D E N T I F I C A T I O N T A P E

Composition of Detectable Tape Shall Consist of .50 Mil. Thick, Solid Core, Encased in a Reinforced Protective Plastic Jacket That Is Resistant to Alkalis, Acids, and Other Destructive Elements Commonly Found in Soil. Overall Thickness Shall Be 4.5 Mil. Nominal and a Width of 3".

Color Shall Be Bright Green with Printed Black Letters on One Side Stating, "Caution – Sewer Line Buried Below."

Tape Shall Be 3" Detectable Tape as Manufactured by Pro-line Systems.

Said Tape Shall Be Installed Two Feet above Pipelines. This Tape Shall Be Installed in Conjunction with Main Lines Including Service Connections.

G A T E V A L V E S

Gate Valves in Sizes 2" Through 30" Shall Be Manufactured to Meet, and or Exceed, All the Requirements of AWWA C515 for Resilient Seated Ductile Iron Gate Valves.

Valves Shall Include the Following Specific Design Criteria:

A. Valve Body Shall Be Manufactured of Ductile Iron and Have a Working Pressure of 250 Psi in All Sizes.

B. All Ferrous Components Shall Be Ductile Iron, Body, Wrench Nut, Stuffing Box, and Valve Wedge.

C. The Words "Di" or "Ductile Iron" Shall Be Cast into the Valve Body along with "250w" or "250 Psi".

D. The Valve Wedge Shall Be Ductile Iron, Encapsulated with Nitrile Rubber, in Sizes 2" Through 12", SBR Rubber Sized 14" Through 24", and EDPM in 30". The Wedge Shall Be Symmetrical and Seal Equally Well with Flow in Either Direction.

E. Valves Shall Have a Fusion Bonded Epoxy Coating Inside and out for Maximum Corrosion Resistance, Complying with Ansi/awwa C550 Applied Electrostatically Prior to Assembly.

F. The Valve Shall Have a Smooth Full Diameter Waterway with No Recesses to Trap Debris or Obstruct Flow.

G. Valve Stem Shall Be High Strength Corrosion Resistant Bronze. Stem Shall Be Sealed by Three O-rings. The Top Two O-rings Shall Be Replaceable with Valve Fully Open and While Subject to Full Rated Working Pressure. O-rings Set in a Cartridge Shall Not Be Allowed.

H. Sealing Gaskets Shall Be Pressure Energized O-rings.

I. Torque Minimizing Thrust Washers Located with (1) above and (1) below the Thrust Collar, Assuring Trouble Free Operation of the Valve.

J. Gate Valves in Sizes 4" Through 12" Shall Conform to U.I. Underwriters Laboratories, and F.M. Factory Mutual Research Corporation.

K. Valves Shall Be NSF Standard G1 Certified.

- L. Bolting Materials Shall Develop the Physical Strength Requirements of Ast a 307, and May Have Either Regular Square or Hexagonal Heads with Dimensions Conforming to ANSI B18.2.1 Metric Size Socket Head Cap Screws Therefore Are Not Allowed.
- M. Operating Nut Shall Have Four Flats at Stem Connection to Assure Even Input Torque to the Stem.
- N. Flanged Valves in Sizes 3" Through 12" Shall Be O S & V 125 Lb. Flanges. Manufacturer Shall Be Able to Furnish 250 Lb. Flanges If Required.
- O. Valves 16" and Larger Shall Have an Enclosed Gear Case. Design Shall Be of the Bevel or Spur Gear Type, Dependent upon the Depth of Bury and Installation Conditions of the Valve.
- P. Valves and Hydrants Shall Be of the Same Manufacturer.

In Addition to All the above Requirements, the Pressure Ratings and Specifics of the above Conditions must Be Published in the Manufacturers Catalogs. The Manufacturer must Have Been in the Valve Manufacturing Business for a Period of at Least Twenty (20) Years, and Have a Ten (10) Year Warranty Against Defective Material and Workmanship.

Valves Shall Be American Flow Control, Series 2500 Ductile Iron Resilient Wedge Gate Valves.

P L U G V A L V E S

Plug Valves Shall Be of the Non-lubricated, Eccentric Plug Type, Resilient Seated, as Manufactured by Dezurik, Model 100, or Equal.

Minimum Open Area Through the Valve Shall Be Equal to or Greater than 80%.

Valves Shall Be Designed for Use with a Working Pressure of at Least 150 Psi and Shall Provide a Drip-tight Shutoff.

Valves Shall Be Manufactured Using the Following Materials For Construction:

Valve Body – ASTM Class B Cast Iron

Seat – Nickel

Plug Facing – Neoprene

Bearings – Stainless Steel

Packing – Nitrile-butadiene

Valves Shall Have a ¼-turn Extension Stems Operator and Flat Face 150# Flanged Ends in Accordance with ANSI Standards or Geared Operator.

Valves 4" and Larger Shall Be Furnished with Mechanical Joint Connections, Conforming to ANSI B16.1 Call 125 Drilled Flanges, and Valves less than 4" Shall Be Furnished with Flanged or Threaded True Union Connections.

End Connections Shall Be as Required for Compatibility with the Pipes to Which They Are Installed.

Plug Valves Shall Be Manufactured by Dezurik or Approved Equal.

VALVE BOXES

Valve Boxes for Valves 4" Through 12" Shall Be Manufactured of Cast Iron. They Shall Have a Minimum Wall Thickness of $\frac{1}{4}$ ". The Clear Shaft Opening Shall Be Not less than 5 $\frac{1}{4}$ ". Reference Figures S11 and S12.

Lids Shall Be Drop Type, Adjustable from 24 X 36 or 36 X 48 as Required.

Boxes Shall Be of the Two Piece Design, with a Round Bottom.

All Pieces Shall Have a Protective Coating of Coal Tar Epoxy.

Valve Boxes Shall Be Screw Type Adjustable as Manufactured by Tyler Pipe.

FORCE MAIN BALL VALVES

Ball Valves 1 $\frac{1}{4}$ " Through 2 $\frac{1}{2}$ " Shall Be Used on All Force Mains. These Valves Shall Be of Cast Red Brass Containing 85% Copper and 5% Each of Tin, Lead, and Zinc.

The Ball Shall Be Flour-carbon Brass and Shall Be Held in Position by and Sealed off Against Seats of Buna N Rubber That Are Held Securely in Place with Epoxy Adhesive.

Valves Shall Be Watertight Against Flow in Either Direction. Directional Valves Shall Not Be Permitted.

The Waterway Shall Be No Smaller than the Nominal Size of the Valve and Shall Be Smooth, with No Abrupt Changes in Size to Create Resistance to Flow. (Full Port) the Only Exception Being the 2 $\frac{1}{2}$ " Valves Where a 2" Port Will Be Permitted.

The Stem That Turns the Ball Shall Exert No Other Force on it Except to Open or Close the Ball and Shall Be Held Securely in Place by Means of a Bronze Ring.

The Minimum Diameter of the Stem at the Point of Attachment to the Valve Body Shall Be as Follows:

Valve	Minimum
-------	---------

1 ¼	7/8
1 ½	7/8
2	1
2 ½	1

The Seal Around the Stem Shall Consist of Two O-rings. Each Valve Shall Have a Substantial T-head for Operation of Opening and Closing with a 90° Turn of a Standard Slotted Wrench.

The Stops or Lugs for Controlling the Motion of the T-head Shall Be Enclosed and Properly Positioned to Line up the Waterway Through the Ball with Sewage Passage Through the Valve Body.

The Valve Shall Be of One Manufacture and Shall Be Available from 1 ¼" Through 2 ½".

Valve End Connections Shall Be Iron Pipe Threads with the Use of Mip X Gasketed PVC Adapters.

All Valves 1 ¼" Through 2 ½" Shall Be Similar to Ford Meter Box Company's Ball Curb Valves B11 Series.

R O A D W A Y V A L V E B O X E S

Valve Boxes 1 ½" Through 3" Shall Be Manufactured of Cast Iron. They Shall Have a Minimum Wall Thickness of ¼". The Clear Shaft Opening Shall Be Not less than 4 ½".

Lids Shall Be Drop Type, Adjustable from 36" X 48" as Required. When Greater Depths Are Encountered, the Use of Middle Piece Extensions Shall Be Required.

Boxes Shall Be of the Two Piece Design, with an Arched Bottom.

All Pieces Shall Have a Protective Coating of Coal Tar Epoxy.

Valve Boxes Shall Be Screw Type Adjustable as Manufactured by Tyler Pipe.

S W I N G C H E C K V A L V E S

Swing Check Valves in Sizes 4" Through 12" Shall Be Manufactured in Accordance with AWWA C508 Resilient Seated Design. Valves Shall Be Manufactured of Ductile Iron Meeting or Exceeding ASTM A536-65-12 and Rated for 250 Psi Cold Water Working Pressure.

Valves Shall Have a Ductile Iron Disc Fully Encapsulated with Buna N Rubber. The Disc Travel to Closure Shall Not Be More than 35 Degrees and Shall Seal Drop Tight at Pressures above 5 PSIG.

Valves Shall Be Coated with Fusion Bonded Epoxy on All Internal and External Ferrous Surfaces. The Valve Shall Be Designed So That the Disc Shall Be the Only Allowable Moving Part and Said Disc Shall Be Reversible So Either Side Will Seal Equally. The Valve Shall Have 100% Unobstructed Flow Area Free of Pockets and Voids.

A Factory Installed Back Flushing Actuator Can Be Furnished as an Option for Priming Pumps, Back Flushing, Draining Lines and System Testing. Options Shall Be Shown on Drawings and or Bid Items.

Valves Shall Be Equal to American Flow Control Series 2100 Ductile Iron Resilient Seated Check Valve. Reference Figure S13.

S A D D L E S

Brass Service Saddles for PVC Pipe Shall Be Manufactured from AWWA C800 Water Works Brass of 85, 5, 5, and 5, per ASTM B-62.

They Shall Be Machined to Rigid Specifications and Allow Ample Width to Provide Greater Distribution of Clamping Pressure to Avoid Deforming of the Pipe.

Bronze Saddles in Sizes 4" Through 8" Shall Be Designed as a Single Unit with the Upper and Lower Casting Permanently Hinged Together with a Silicon Bronze Pin. The Tightening Device of the Saddle Shall Be a Slotted Hex Head Silicon Bronze Bolt as to Prevent Over-torque with the Lower Casting Being Tapped.

Bronze Saddles in 10" Through 12" Shall Be Designed as a Two Piece Unit with the Upper and Lower Castings Bolted Together Using Silicon Bronze Bolts with the Lower Casting Tapped for Bolting.

Outlet Taps Shall Be 1 1/2 " Through 2" Having AWWA Type Threads.

For PVC Pipe, 4" Through 12", S-90 Series Saddles, as Manufactured by Ford Meter Box Co., Inc., to Be Used.

C O R P O R A T I O N S T O P S

Ball Corporation Stops Shall Be of the Ball Valve Type. The Ball, Stem, Nut, and Body Shall Be of Cast Red Brass Containing 85% Copper, 5% Tin, 5% Lead, and 5% Zinc. The Ball Shall Be Teflon Coated and Shall Be Held in Position By, and Seal Against, Seats of Buna-n Rubber. Seats Shall Be Secured in Place by an Epoxy Adhesive.

Corporation Stops Shall Be Designed to Create Minimum Resistance to Flow. The Waterway Shall Be No Smaller than the Nominal Size of the Valve. Valves Shall Be Watertight at Any Pressure up to 300 Psi.

Each Stop Shall Be Designed So That They May Be Installed in Mains under Pressure Using Standard Tapping Machines.

Corporation Stops in Sizes 1 1/2" Through 2" Shall Be Available from the Same Manufacturer.

Stops Shall Have Threads Conforming to AWWA Standard C800. The Inlet Threads Shall Be AWWA. The Outlet Connections Shall Be Male Iron Pipe.

Ball-corp Corporation Stops Shall Be Manufactured by Ford Meter Box, Co., Inc. of Wabash, In.

F L U S H O U T C O V E R S

Flush out Covers for Use with Flush Box Connections Shall Be Manufactured of Cast Iron.

The Cover Shall Be Designed to Fit an 18" I.d. Meter Box and Shall Have a Rise of Approximately 4".

Covers Shall Have an Overlapping 11 1/2" Locking Lid. The Locking Mechanism Shall Be a Standard Bronze Pentagon Nut and Bolt with a Cast Iron Locking Worm.

The Contractor Shall Furnish Four Box Wrenches to the Owner for Each Contract Awarded.

Lid Shall Be Marked Sewer and Shall Be Similar to Ford Meter Box Cover C-32.

F L U S H O U T B O X E S

Meter Boxes Shall Be Manufactured from a High Density Polyethylene with a Minimum Material Density of .950 G/cc per ASTM D1505.

Boxes Shall Be of One-piece Molded Construction, Incorporating an Insulation Layer in the Molded Wall to Resist Frost Jump.

The Normal Wall Thickness Shall Not Be less than .500.

Meter Boxes Shall Have a Minimum Thermal Transfer Value of 4.0 According to ASTM C-171, Allowing for Maximum Insulating Factors.

Each Box Shall Incorporate a Molded in Shelf Located Inside Each Box Approximately Three Inches from the Top to Accommodate an Insulation Pad as Required.

The Vertical Load, Free-standing, Shall Be a Minimum of 26,000 Lbs.

The Horizontal Load Shall Vary According to the Diameter of the Box, with a Minimum of 180 Lbs., and a Maximum of 240 Lbs.

Boxes Shall Have a Top Flange for Cover Seating, and an Anti-settling Flange on the Bottom.

All Edges Shall Be Clean and Smooth Interior and Exterior to Prevent Frost Heaves.

The Interior Shall Be Bright White in Color for Light Reflection to Each Meter Reading.

The Exterior Shall Be Black in Color to Retard U.v Degradation in Storage.

Adjust to Grade Box Extensions Shall Be Available from the Manufacturer in Heights of 3", 6", and 12" in Most Common Diameter Boxes.

Tapered Risers Shall Also Be Available to Accommodate Sloping Installations. Manufacturer Shall Be Able to Furnish a Wide Range of Boxes, Ranging in Diameters from 15" Through 36", with Depths of Bury from 18" Through 48".

The Particular Applications Shall Be as Follows:

18 X 30

Meter Boxes Shall Be Manufactured by Mid-states Plastics, Inc.

C H E C K V A L V E S 1 ¼ " T H R O U G H 3 "

Check Valves 1 ¼" Through 3" Shall Be Manufactured of PVC. Valves Shall Utilize a Flapper Valve to Prevent Backflow and Shall Be Clearly Marked with the Direction of Flow. End Connections Shall Be Solvent Weld Socket Ends. Valves Shall Be Manufactured by Flow Control, Inc.

S E W A G E C O M B I N A T I O N A I R R E L E A S E A N D V A C U U M V A L V E S

All Valves under this Section Shall Be Designed for Use with Sewage Force Mains. The Valves Shall Be Designed to Keep the Valve Operating Mechanisms Free from Contact with the Sewage. Valve Body Shall Be Cast Iron, Valve Mechanism Cast Bronze, Needle and Seat Buna-n, Lever Pins and Float Stainless Steel, and Stem and Guide Bronze. All Valves to Be Furnished with Accessories for Back Flushing and Shall Be Vm801-vm802 Sewage Air and Vacuum Valve as Manufactured by Val-matic Corporation. Reference Figure S10.